distributed
data
processing

Manitoba Data Services

DISTRIBUTED DATA PROCESSING

AT

MANITOBA DATA SERVICES

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INTRODUCTION

Purpose of Publication

This document presents Manitoba Data Services' (MDS) solution for the inclusion of distributed technologies in its service offering.

It has been acknowledged for many years that no facet of data processing should be considered in isolation. With the inclusion of distributed technologies, consideration of the broader issues of managing technological growth on a global basis becomes even more critical.

In addition to the specifics of MDS' offering, issues and concerns of which client management should be aware to take full advantage of these new opportunities are considered in this paper.

Evolution of Data Processing

At the time of introducing computers into the business environment the goal of data processing organizations was to automate the processing and manipulation of data, primarily to relieve clerical personnel of laborious, repetitive tasks and to reduce costs by displacement of personnel. With the increased availability of analytical and programming staff and with the introduction of communications capabilities and data base technologies the emphasis shifted to information systems.

These large information systems have been developed to meet the needs of the "corporation" or "organization" as a whole

but generally have not been sufficiently flexible to allow for easy customization for specific needs of subgroups within the organization.

This has created the need for large programming staffs whose main activity is increasingly the modification and maintenance of existing application systems, resulting in fewer resources being available to develop totally new applications.

Many organizations have realized that there is a need to share information between geographically separated groups within the organization. Together with the desire by end users to have more control over "their" information and processing, these problems have shown the need for: the distribution of computer power, information and application customization, and for the reevaluation of data ownership and management.

Merging Technologies

As both the data processing and the communications industries have evolved they have also begun to merge and it has become less clear where one begins and the other ends. One direct result of this merging is the ability to distribute processing equipment, function and intelligence in varying degrees as required by any given system.

This distributed technology therefore offers the opportunity to management to give the users of the information the ability to have some customization of their part of the system and the necessary degree of autonomy and control over their information systems.

There are also opportunities for reduced costs in processing particularly where organizations have groups in different geographic locations.

This has been demonstrated in the insurance industry, where general programs have been developed centrally, "transferred" to branch office computers, where insurance applications can be preprocessed and "client programs" can be produced, and the applications electronically forwarded to the corporate head office for further processing and "data base" updating.

Evolution of Manitoba Data Services

Effective April 1, 1979, legislation was enacted establishing MDS as a commission of the Province of Manitoba.

The Manitoba Data Services Act states "The aim and object of the commission is to provide and maintain computer and data processing services available to the government, government agencies and government supported institutions and, subject to this act, other persons".

MDS has been in a state of continuous evolution from its origin as "The Central Electronics Bureau" in 1959, operating unit record equipment out of the Legislative Building.

The first business computer was an IBM 1401. Installed in 1963, this complemented the IBM 1620 scientific computer already in place.

An IBM 360/30 replaced both machines in 1965, and in April of 1967 the organization moved to its present location in

the Norquay Building becoming the Manitoba Government Computer Centre (MGCC).

Installation of Water Resource's batch entry machine in January 1967 established the Manitoba government's first data processing telecommunications link. That same year saw the first online system, Motor Vehicle's driver's system with six terminals, and the second system, Revenue Tax, with four terminals. These systems were among the earliest nonexperimental online systems implemented in Canada.

A second RJE* was installed in the Department of Highways in 1969. This was followed shortly by more online systems: Manitoba Public Insurance Corporation (1972) and the police network (1974).

Remote intelligence appeared with a third batch link to the Department of Municipal Affairs' data entry and job submission facility. Time sharing was introduced in 1974 when TSO was added to the services offered. By 1975 the increased demand for services resulted in a third IBM 360/158 processor being installed.

In 1975 MDS was established as an independently operated division of the Manitoba Telephone System with the purpose of making available advanced computing capability to both government and the crown corporations.

* For definition see page 9, paragraph 1.a.

The data processing workloads of the Manitoba Telephone System, the Manitoba Health Services Commission, and Manitoba Hydro were subsequently migrated to MDS.

As a combined result of this substantial growth and technological change, MDS has installed MVS/JES3, an advanced operating system for multiprocessing systems, and upgraded Central Processing Unit hardware from a 370/158 - 370/168 configuration to a 370/168 - 3033 configuration and most recently to an MP 3033 configuration. Along with this MDS has successfully managed many complex environmental and support equipment changes in the areas of electrical/mechanical, support software, data storage and online systems.

MDS has grown to support 40 remote batch processors and over 400 interactive terminals, distributing computer access throughout the province.

MDS has also emphasized development of personnel resources to be capable of managing and operating a complex data processing installation as well as providing the necessary expertise to consult with and assist clients in meeting their data processing requirements.

The ability to respond efficiently to changing technologies with minimal disruption and to anticipate, plan and be prepared to meet client requirements has always been a primary goal.

DISTRIBUTED DATA PROCESSING CONCEPT

General Concepts of Distributed Data Processing

With the advent of multi-varied technologies, a new industry "label" has become common - Distributed Data Processing. Like many other newly coined terms, the meaning of Distributed Data Processing is not commonly agreed upon, nor understood.

In investigating stated concepts of distributed processing, many sources were researched including:

1. James Martin - a leading author of books on data processing and communications technologies.

2. Proceedings published by GUIDE, an international computer users group.

3. Major computer manufacturers' definitions.

Most sources varied greatly in their definitions of what Distributed Data Processing really meant.

Two courses of action were apparent; include anything and everything in data processing within the term Distributed Data Processing, or define the elements of Distributed Data Processing as it relates to the Manitoba public sector environment to enable definition and clarification of the issues involved. MDS has chosen the latter course.

Manitoba Data Services' Definition of Distributed Data Processing

Concept

This section is intended to provide a common point of reference on Distributed Data Processing.

MDS' approach to define Distributed Data Processing is to:

1. List those items not included as part of Distributed Data Processing.

2. Define elements which must be present in a distributed environment.

3. Define required attributes for various components.

The elements not included in a distributed definition should still be considered as part of the data processing environment. The management issues and concerns section of this report is intended to include all aspects of information processing (including data processing) within the Manitoba public sector.

Definition

1. Not Included

   MDS concluded that the following functions are considered to be outside of the range of distributed processing services, and therefore have not been included in this distributed processing concept.

a. A processing unit at a remote location communicating with the host (central computer) only by Remote Job Entry (RJE) protocol (i.e. submitting isolated work requests for later scheduling).

   Note: RJE is currently well documented, supported and managed.

b. A processing unit at a remote location operating solely as a controller of multiple computer terminals (cluster controller).

c. A processing unit at a remote location operating as an RJE and cluster controller with no other functions.

d. A stand-alone processor not linked with a host.

2. Included

The following elements must be present for a computer solution to be called distributed:

a. There must be more than one processor.

b. Processors are physically distributed and interact through a communications network.

c. There is a high level management or operating system which unifies and integrates control of the shared central host resources.

d. The host architecture must include the capability to connect all distributed locations to each other through communications network control.

e. A distributed application has components located at more than one node (position) on the network. Components of an application would include computer programs, data, or processing power.

Note: The host is also a node in this definition.

3. Required Attributes

a. The remote processor must have the ability to operate if the access to the host is lost. Likewise, the host processor must have the ability to operate if the remote connection is lost. In either case reconnection must be able to be made without affecting the rest of the communications network.

b. There must be a formalized procedure (whether manual or automated) to manage maintenance and application levels (i.e. to insure all sites remain current and compatible).

c. Security to, from, or through the host must be maintained. This involves controlling:

- which remote sites may communicate through the central site

- the remote site's access to data stored centrally

- central site's access to data stored at a remote location.

Technical Constraint

In a distributed processing network, there is a need for a communications network control facility commonly referred to as "network architecture". This insures that all computers are able to communicate.

There are several network architectures in existence. All perform basically the same function and currently, all are incompatible.

MDS' communication protocol is based on IBM's "System Network Architecture" (SNA), consequently all sites to be connected to the central computer must be compatible with MDS' implementation of System Network Architecture (SNA).

Hardware/Software Requirements

Following is a list of minimum requirements that the distributed processor hardware and software should satisfy.

1. The hardware and software should support approved* high level programming languages.

2. Utilities should be available to dump, load and reformat data files.

* See Section 4, page 31.

3. When a magnetic tape drive is required for logging, data transfer or data backup, the hardware and software should encode the data and labels to be compatible with the host processor.

4. The hardware should provide sufficient auxiliary storage to accommodate the distribution of its operating system from MDS.

5. Sufficient diagnostic capability, including appropriate peripheral equipment, should be provided to ensure satisfactory levels of availability.

6. The distributed processor must use an unmodified version of an operating system supported by MDS.

7. The hardware and/or software should be capable of collecting network and operator statistics for management reporting and control.

8. The processor must be able to send and receive data files, RJE input/output, messages, programs, and screen formats to/from a host processor over a communications facility using an MDS supported line protocol.

Criteria for Selection of Distributed Data Processing Applications

The purpose of this section is to provide a checklist of characteristics which will assist in the assessment of applications as candidates for a distributed processing system. Applications that do not meet any of these criteria should not be considered as candidates.

Applications which fit one or more of these criteria may be suitable for Distributed Data Processing. There is no attempt to provide a measurement of suitability in this document. Characteristics such as size, volume and management impact should be measured and rated on an individual basis.

The checklist contains characteristics which appear to be similar. Each item however, has a unique characteristic which may or may not be incorporated with others in an actual situation.

Criteria List

1. Multiple locations with the same or similar functions.

   An example may be regional offices, each handling the same business function, but for a distinct and separate region. Such an application might be decentralized if no other characteristics existed for Distributed Data Processing.

2. A requirement for coordination between locations.

   The same situation might exist as indicated in point 1, but compatibility of data and processing procedures are required so that data can be compared or summarized between locations.

3. A requirement for data at multiple locations.

   The information belonging to one location is required on an exception basis by another location. An example might be inventory availability reporting.

4. Data exchange between locations.

   Data might be required at a new location which would be transferred, stored and manipulated. An example could be patient record exchanges between hospitals.

5. A central location which supports local sites.

   A central management with local functional responsibility exists in the organization. Unlike point 2, compatibility between remote locations may not be necessary if there is no requirement for comparison. Some or all data may be generated centrally.

6. Locally generated data with a central requirement.

   This situation is the reverse of point 5. Locally generated data would be transferred to the central site for summarization, auxiliary processing or storage.

7. Communication costs significant portion of the total application cost.

   Costs are proportional to the volume of activity and the distance between locations.

8. A transaction oriented system.

   Activity against the data files is event driven. A large volume of batch updating does not occur against local data files.

9. A minimum of two different functions requiring two different types of processes.

   A process control or a word processing function may require a specialized processor but may need to tie in with another processor (perhaps the host) for data retrieval or centralized accounting.

10. A requirement for high availability of one or more functions of a larger system having many functions.

    High availability through a duplexed system for one key function which ties into a larger administrative system.

11. A requirement for user controlled response.

    A user requires the ability to adjust functions on the CPU to enable one function to have high response during peak load periods. An example might be an alarm reporting system which requires immediate response and which might be capable of cancelling all other jobs on the system.

Benefits

1. Benefits of Distributed Processing

   - Allows the use of a less complex machine for simple functions better suited to a small processor.

   - May permit development of systems not previously feasible due to line costs, etc.

- Allows management control of costs at the remote site. Costs are more predictable, provided adequate capacity is available.

2. Benefits of Connection to a Host

- Allows access to packages only available on a large machine.

- Allows use of large central information storage facilities.

- Allows for distribution of processing requirements. Simple tasks on a small machine, complex tasks on a larger, more powerful machine. "The best of both worlds."

- Allows centralized distribution and maintenance of software for multiple sites running the same system(s).

MANITOBA DATA SERVICES' DISTRIBUTED DATA PROCESSING PRODUCT OFFERING

Charging Elements

MDS' pricing for distributed processing is composed of four elements:

1. Rental of distributed hardware.

2. Rental of operating system and product software.

3. Support and maintenance of the distributed site hardware and software.

4. Standard schedule of rates for host processing activity and storage, lines, ports, etc.

Explanation

1. & 2. Hardware/Software Charges

Based on client specifications, MDS will acquire hardware, required software, and related equipment.

The above will be made available to the client by MDS at the vendor standard lease cost.

Cost to the user will vary with selected configuration.

Representative sample configurations for distributed workstation systems would be:

a. A small distributed processor, related equipment and operating software
Four online terminals

Approximate cost $2,500/month

b. A medium-sized distributed processor, related equipment and operating software
Eight online terminals

Approximate cost $7,000/month

The above prices are only for representative purposes. Actual system costs will vary depending upon hardware and software specified by the client to meet his individual distributed data processing requirements.

3. Support Charges

Support charges are directly related to MDS' costs. The personnel required and hence the cost of support will depend on the numbers and types of distributed machines in the client base.

To minimize support costs, a "standard product line" will be developed in cooperation with assigned client staff. This activity is currently in process and the selected line of standard distributed processing products is anticipated to be announced shortly. To ensure continued acceptability and effectiveness, the

standard distributed processing product line will be reviewed with clients on a regular basis.

MDS provides the following support options.

Standard Product Line

Option A: "MDS Managed Support Program"

1. Basic support coverage:

   - charged at a percentage of distributed site cost/month

   The following services will be provided under the basic support offering.

   Support charging is based on quantity pricing. There will be one rate for the first installation of a machine-type installed for/by the client, followed by incrementally lower per machine rate for subsequent installation of machines of the same type.

   a. Installation - assistance (where not provided by vendor) on installation and configuration of distributed hardware, product software and host interfaces.

   b. Maintenance of distributed hardware including contact to vendor and coordination of vendor services.

c. Standard maintenance of distributed product software and host interfaces (i.e. application of new releases).

d. Problem determination on all components of distributed site including hardware, operating and product software, lines, and modems. This could also include evaluation of performance/response degradation.

e. Resolution of all service problems external to the client application or client applied changes.

f. Review and assistance in capacity planning for initial installation and subsequent reconfiguration or upgrades to the distributed site, to ensure that MDS continues to provide adequate response.

g. Basic training in operation of the distributed site where not provided by vendor.

h. Change management - where changes require coordination and scheduling with changes to host site, other distributed sites, or multiple changes to one distributed site.

i. Review/acceptance of plans for reconfiguration of a distributed site which may have implications for established communications networks.

j. Analysis of data backup procedures, facilities available and capacities required.

k. Assistance in disaster recovery planning.

2. Additional Support Services Available:

Additional services outside of the basic support coverage:

- hourly rate

The following are examples of services that would be available at an hourly charge.

a. Operating and product software maintenance outside of standard maintenance agreement, not including modification or customization of vendor's standard software.

b. Assistance in planning and implementing security at the distributed site.

c. Performance monitoring and tuning of the distributed site.

Option B: "Client Managed Support Program"

a. A one time installation charge of a percentage of monthly distributed site cost to include up to 10 hours of installation support.

b. All ongoing requests for support from MDS would be charged at the then current hourly rate.

Nonstandard Equipment

- support agreement will be negotiated prior to installation

Under either standard equipment option and for non-standard equipment, special expenses incurred by MDS would be a direct charge to the client.

4. Host Processing Activity and Storage, etc. Standard MDS rate schedule will apply.

Related Costs

Distributed site costs which will be incurred by the user, but which do not form part of MDS' offering include:

- personnel required to operate the machine(s)
- consumable supplies such as paper, cards, ribbons
- facility modifications
- electricity
- air conditioning
- heating

- floor space

- administrative (local)

- security, fire protection equipment.

Items not specifically mentioned under either category will be the responsibility of the client. Additional support could be negotiated.

Schedule of Rates

1. Distributed hardware

   - vendor standard lease cost

2. Operating system and product software

   - vendor standard lease cost

3. Support

Standard Product Line

OPTION A: MDS Managed Support Program

a. Basic Support Coverage

1 machine installed	X% of monthly hardware and software rental/month
2 - 4 machines of same type	Y% of monthly hardware and software rental/month
5 - n machines of same type	Z% of monthly hardware and software rental/month

b. Additional Services — hourly rate

OPTION B: Client Managed Support Program

a. One time installation charge — X% of monthly hardware and software rental

b. Ongoing support — hourly rate

Non Standard Equipment

- to be negotiated

4. Host processing and storage, etc.

- standard rates

Note: Hardware - (included in support charge) all distributed site hardware with the exception of display terminals.

Benefits of MDS' Support Offering

- One contact point for problem resolution.
- MDS will manage currency of software, compatibility to the host or other distributed sites.
- Availability of specialists for consultation on:
  - capacity planning
  - tuning/performance analysis

- training

- security/disaster planning.

Implementation - A Project Approach

The planning, development, installation and implementation of a distributed system has the potential to be more complex and to involve more organizations (data processing departments, client department, host data processing supplier, software vendor, hardware vendor, and communication vendors) than a centralized or decentralized system. Because of this it is more important that the task be approached in a methodical way with sufficient opportunity to track and coordinate activities within the plan.

The approach recommended by MDS for distributed systems which will be connected with MDS is to assemble a project team with members from the "client" area, the organization's data processing department and MDS. The project should be led by the organization's data processing department and should be managed using standard project management methods. MDS' involvement will be arranged with the client data processing department.

Specific attention must be paid to the fact that there are many additional "operational" concerns for which solutions have to be planned and implemented, due to the additional capabilities of the distributed hardware, the more complex telecommunications network, and problem notification, identification and resolution activities.

The use of the MDS' Planning Control Office staff can be arranged for clients with limited project management staff or experience.

MANAGEMENT ISSUES

This section presents a number of issues which arise when considering the provision of data processing systems, and become even more crucial when expanding into Distributed Data Processing. Solutions to the problems discussed in this section must be implemented at the client management level as well as within the client user department and computer services departments.

Overview

In the last several years, computer technology has changed dramatically. Technological advances have made computers more powerful, and have significantly increased the cost-effectiveness of computing. As advances in the technology and in the management of information processing continue to occur, opportunity exists for more effective use of data processing by the public sector. The trend towards making information more accessible to the decision makers of an organization is an important result of the advancements in computer technology. This trend has been labelled Distributed Data Processing (DDP).

Distributed Data Processing is not a panacea for all problems. To be beneficial its use must complement the overall plan for providing information.

We, at MDS, recognize the capability that exists in today's technology, and the potential for utilizing that technology in many areas of the public sector.

We have also considered the consequences of lack of forethought given to some major issues which will arise as the Manitoba government takes advantage of expanding information handling capabilities.

The following explore MDS' analysis of management issues to be considered and areas in which decisions must be made.

1. Planning for the Future

2. Compatibility

3. Information Use and Control

4. Management

5. Staffing

Analysis of Management Issues

1. Planning for the Future

a. Affected Areas

Changing technology is bringing the computer within the reach of the end user or non data processing professional. It is also affecting areas once not considered under the heading of "data" processing.

Consideration should be given to development of a strategic plan for "information" processing which would include all areas of data handling and communication within the public sector. These would include such components as:

- traditional government data processing systems, many already in place, such as registration or financial systems

- office automation; word and text processing, information search and retrieval systems, electronic mail, etc.

- design/development systems; capability exists to augment professional and technical skills with new tools for evaluation and computer-aided design

- inventory management

- point of sale systems which generate data used by other areas

- decision support systems; generation of information for purposes of evaluation, control and planning

- public reference systems/data base systems.

b. Planning Responsibilities

The main question to be asked regarding the information processing components listed earlier would be:

- Will there be a need to connect or integrate these systems at some future time, and if so, how can this be planned to ensure that it is possible and cost-effective?

- Are there advantages, or needs for resources to be shared among various groups (departments, agencies, crown corporations) within the public sector? Resources in this case includes devices, data, computer programs, functions, or people.

Thought should be given to the formulation of groups with corporate authority and responsibility for:

- planning an information strategy
- implementing the strategy
- setting and enforcing policy
- researching and evaluating technological advances.

c. Development Options

Given the new technologies, there are many ways to implement systems:

- totally central, large scale machines; allows sharing of programs, facilities. However, two systems running on one machine still does not imply connectability.
- stand-alone; i.e. many small unconnected machines, indicating no need to integrate systems or data

- distributed; a combination of these two approaches, using a small machine for some functions, the larger one for others, and for tying together systems and/or data.

2. Compatibility

A primary problem with lack of planning is that it may result in acquisition of equipment and design of systems and data without regard to other potential users. If uncontrolled this will result in the growth of incompatible resources.

Most data will be needed somewhere else in the organization(s) and should be accessible by those other areas to avoid redundancy.

In the case of multiple machines, users may be unable either to exchange programs or move data from one machine to another, and it may be difficult or impossible to connect the machines via communications networks.

Consideration should be given to the benefits of resource sharing within the public sector.

Standards for development of applications would help to increase both productivity and quality of systems, as well as increase the potential for sharing these systems.

A list of items to be considered in standardization would include:

- programming languages and tools

- documentation techniques

- training

- communications

- data design/accessibility and storage

- implementation techniques

Guidelines for selection of new equipment would help ensure that distributed systems remain compatible and interconnectable.

3. Information Use and Control

With the growing volume of information available, and the growing need and capability to condense, summarize, and to share that information across organizational boundaries, comes also a need for careful management. Privacy and security becomes a major issue in light of new technologies. Security procedures and methods should be established as a framework within which all of an organization's sites must operate.

In addition, guidelines for backup, recovery and disaster plans would help ensure an adequate level of protection for the organization's systems and data.

Data and applications resident in a distributed processor could be documented in a host processor's data dictionary. This dictionary could be used to generate data descriptions for any application development performed for the distributed processor site.

4. Management

a. Options

There are options for managing the evolution of data processing. The two extremes are:

A totally centralized form of management which offers the advantages of coordinated planning so that operational and corporate goals remain aligned. There is a high level, single source responsibility leading to less duplication of effort, better integration and improved cost control over systems development. However, this can also cause problems relating to responsiveness to user demands, growth of bureaucracy and delays in implementation, as well as being somewhat unpopular with autonomous groups in the organization.

A totally decentralized form of management which allows for individual areas to be responsible for setting their own objectives. This method is more responsive to end user needs, accountability is less complex, and implementation generally faster. This approach tends to result in lack of coordinated planning, reduction in the probability of sharing resources and duplication of effort.

Effort must be put into determining which of the data processing components lend themselves to which style of management, in order to maximize the benefits of each.

b. Problems of Growth

The danger of creeping escalation has been with us since the early days of data processing. Once small systems begin to operate, they seem to be added to, grow and spread far beyond their original scope. This danger is multiplied with the growth of distributed sites.

It is therefore important to ensure that this growth is carefully planned and controlled.

Some techniques for managing growth:

- feasibility analysis including risk assessment of proposed acquisition and/or development (to control incompatible functions)

- evaluation to ensure that the capabilities and constraints of particular machines are considered, to allow for most effective utilization

- proper cost distribution and evaluation of "hidden" costs of each new function

- post audit of each new function implemented

c. Acquisition Proposal Guidelines

To determine whether a processing solution is appropriate, the following guidelines could be used in the preparation of an acquisition proposal.

- The proposal should be for an application system rather than simply for hardware. A complete description of the application should be required, including the need, and alternative methods of accomplishing the objective.

- The proposal should be cost-effective. A cost-benefit analysis should be required for each application. The analysis would consider the impact on the requesting user department, comparative operations and communications costs, and reliability, availability and serviceability considerations.

- The proposal must be able to be implemented. Included in the proposed solution could be an evaluation of the technical adequacy of the approach, evaluation of security and privacy implications, procedures for backup and recovery management of the data, and software or technical support required.

- A distributed proposal must be compatible with MDS' distributed processing architecture. The proposed solution must be capable of integration into the distributed processing network without modification to the interfaces of the network.

- The solution should be compatible with the overall management direction and plan.

5. Staffing

In establishing an organization structure to accommodate distributed or stand-alone processing, management should be aware that:

- existing staff may not be trained or in sufficient numbers to be able to support new and expanded functions

- qualified staff are currently in short supply, which will likely continue for three to five years

- due to the rapidly changing technology, continual upgrading of staff is critical

- planning and implementation of an organization to support Distributed Data Processing is complex. The success rate has not been particularly high.

- as installations grow, an increasing amount of time is spent on maintenance. Many sites are now devoting as much as 80% of total personnel resources to maintenance. This leads to hiring/training of more people at each location.

- additional responsibilities to be addressed include problem resolution, maintenance and enhancements to operating software and hardware, and vendor interfaces.

Conclusion

The decision to distribute processing is mainly a management decision rather than a technical one. The distribution of processing should reflect and complement the style of management of the organization. For instance, centralized processing would probably be more compatible with an organization which has centralized its management team, a distributed approach would probably be more compatible with decentralized management.

A Suggested Approach

In analyzing these issues, seven key areas or functions can be identified which must be strategically placed within the organization in order to allow for coordinated growth. The seven elements are:

1. Development of the information processing plan.

2. Identification of the communications architecture or framework for data processing growth.

3. Standards.

4. Feasibility studies for new applications.

5. Data design.

6. Application development.

7. Hardware and software (machines and programs) acquisition.

What is needed is a top-down management approach to ensure that decisions are made at their logical point within the organization structure.

Decisions concerning development of a framework for growth would rest at the senior level.

1. Central Management

   A corporate management approach would apply for setting the overall information strategy of the organization, for developing approval systems for growth and procurement of new devices. A coordinating body would set down standards, and be responsible for post audit on each stage in processing evolution.

   These groups would promote the use of standards across lower levels. They should be encouraging use of available technology to make all areas of the organization as effective as possible. They should also promote the sharing of resources, whether data, people or systems, across organizational boundaries, and ensure compatibility of systems and information.

   To do this will require the formation of coordinating groups within each organization.

2. User Management

   The next level of concern, once the framework has been provided, is to set specific objectives for subgroups of the organization(s). This level of management would be responsible for setting their own priorities in application development, for controlling acquisition of systems

within their group and for ensuring integrity of information.

The objectives at this level would be to promote cost-effective automation, and provide self-service on systems not affecting the overall strategy of the organization.

These groups should support and encourage the use of end user productivity aids to lessen demands on data processing staff, and manage changes within their own areas.

Input would be provided to the central coordinating body enabling it to be responsive to global needs.

3. Manitoba Data Services

As a supplier of data processing services to the province of Manitoba, a major responsibility is the provision of technical support. With input from client advisors, MDS will undertake to develop:

- standards for communications networks within the province

- standards for hardware to be used

- and acquisition of hardware and software based on client identified need.

To achieve advantages in levels of support knowledge and in order to provide overall cost savings to clients MDS would offer a standard product line to the user base. At the same time, flexibility would remain to accommo-

date specific client needs not met by standard offerings.

In order to support distributed processing, MDS offers a wide range of services:

- installation and initial configuration of hardware and standard software

- application of maintenance releases to standard distributed software and host interfaces

- problem determination for hardware/lines/ operating system and other standard software

- problem resolution services on the above

- capacity planning/performance analysis services (tracking/reporting/tuning)

- security/disaster planning guidelines and assistance

- reconfiguration of the distributed site

- physical facilities management (i.e. management of site preparation for new machine installations including electrical, architectural and other environmental changes)

- consulting services on systems and/or equipment

- training/education services in operation of machines, and in the use of end user products.

To make the most effective use of distributed technologies, it is particularly important that MDS be involved in the planning and implementation cycle of new systems of its clients.

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Other Canadian Government Activities/Contacts

1. Accounts Payable Application

Highways Department: Nova Scotia

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(902) 424-2700
Executive Director
Bureau of Management Consulting &
Computer/Communications Services

2. Department of Education System - Province of Quebec
(Registration & Financial Applications)

Andre Gariepy
Director General B.C.I.
(418) 643-8708

3. Hospital System - Nova Scotia

(Accounts Receivable, Accounts Payable, Inventory Control, General Ledger and Payroll Applications)

W. (Bill) J. Bartlett
(902) 424-2700
Executive Director
Bureau of Management Consulting &
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4. Motor Vehicle System - Province of Alberta

Blair Northfield
Computing & Systems Division/Alberta Government Services
(403) 427-7622

5. Court Automation Program - Province of Alberta

Blair Northfield
Computing & Systems Division/Alberta Government Services
(403) 427-7622

6. Securities Commission System - Province of Alberta
(Consumer & Corporate Affairs)

Blair Northfield
Computing & Systems Division/Alberta Government Services
(403) 427-7622

7. Land Assessment System for Urban Affairs - Province of Saskatchewan

Bryce Lundeen
General Manager
SASKCOMP
(306) 565-3986

8. Financial/Inventory System - Province of Newfoundland Liquor Commission

Harold S. Miller
President, Newfoundland & Labrador Computer Services Ltd.
(902) 894-5533

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